Claims

1. Method for pre-filtering training sequences in a radio communication system, in which an antenna arrangement comprising a number of antenna systems is used on the transmit side at least,
   - in which the training sequences are fed via a pre-filter to the transmit-side antenna systems for emission,
   - in which received training sequences are used to carry out a channel estimation of radio transmission characteristics, which are described by spatial correlations, and
   - in which the pre-filter is dimensioned as a function of the spatial correlations.

2. Method according to claim 1, in which the pre-filter is dimensioned as a function of the spatial correlations such that a predefined error value of an algorithm used for channel estimation is achieved.

3. Method according to claim 2, in which the receive-side error value is predefined as a minimum value for a predefined training sequence length or in which the predefined error value is achieved by adjusting the length of the training sequences.

4. Method according to one of the preceding claims, in which an MSE algorithm is used for channel estimation on the receive side.

5. Method according to one of the preceding claims, in which a beam forming method is implemented by the pre-filter for every training sequence, in that the pre-filter assigns both a power and an antenna system to the training sequence.

6. Method according to one of the preceding claims, in which the pre-filter adjusts the training sequences to the radio transmission channel characteristics.

7. Method according to one of the preceding claims, in which the training sequences are pre-filtered based on the following equation:

$$F \cdot S = V_{Tx}^{*} \Phi_f S$$

where:

S is the transmit-side training sequence matrix,

F is the transmit-side pre-filter matrix,

V_{Tx} is the eigenvectors of a transmit-side correlation matrix with long-term stability with transmit-side radio channel coefficients and

Φ_f is the diagonal matrix for power assignment.

8. Method according to claim 7, in which the diagonal matrix Φ_f is formed taking into account an MSE error value ε based on the following formula:

$$\varepsilon = tr(\Lambda_{Tx}^{-1} \otimes \Lambda_{Rx}^{-1} + \frac{N_t}{N_0}(\Phi_f \Phi_f^H \otimes I))^{-1}$$

where

N_t is the training sequence length,

N_0 is the noise power,

I is the unit matrix,

Λ_{Rx} is the eigenvalues of a receive-side correlation matrix with long-term stability with receive-side radio channel coefficients,

Λ_{Tx} is the eigenvalues of the transmit-side correlation matrix with long-term stability with transmit-side radio channel coefficients.

9. Method according to claim 7 or 8, in which the MSE error value ε is minimized for a transmit-side and receive-side correlation of radio transmission channels or antenna systems in respect of the diagonal matrix Φ_f based on the following formula:

$$\underbrace{\min\quad tr}_{\Phi_f}\left(\Lambda_{Tx}^{-1}\otimes\Lambda_{Rx}^{-1}+\frac{N_t}{N_0}\left(\Phi_f\Phi_f^H\otimes I\right)\right)^{-1}$$

with a power restriction being defined as a secondary condition based on the following formula:

$$\rho = \sum_{l=0}^{M_{Tx}} \Phi_{f,l}^{2}$$

10. Method according to claim 7 or 8, in which the following applies for a transmit-side correlation of radio transmission channels or antenna systems for elements of the diagonal matrix Φ_f:

$$\Phi_{f,l} = \left[\frac{1}{M_{Tx}} \left(\left(\frac{N_t}{N_0} \right)^{-1} tr(\Lambda_{Tx}^{-1}) + \rho \right) \cdot I - \left(\frac{N_t}{N_0} \right)^{-1} \Lambda_{Tx}^{-1} \right]^{0,5}$$

with the secondary condition $\Phi_{f,l} \geq 0$.

11. Transmit station and/or receive station of a radio communication system with means, which are embodied to implement the method according to one of claims 1 to 10.